Claims:

1. A torque-transmitting assembly comprising:

a) a female coupling member with a bore;

b) a radially flexible member, received within the bore, defining a hollow shape with an opening; and

c) an elongated shaft member made of a super-elastic alloy, received within the opening,

whereupon relative motion among at least two of the members causes the radially flexible member to contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and radially flexible member into surface-to-surface contact, securing the members together in a fixed relative position.

2. The assembly of Claim 1 wherein the radially flexible member has an external surface that frictionally engages the bore upon relative motion.

3. The assembly of Claim 1 wherein the shaft is tubular with a cannulation.

4. The assembly of Claim 3 wherein the bore of the female coupling member further comprises a cannulation aligned with the shaft cannulation, for common passage of a guide wire there through.

5. The assembly of Claim 1 further comprising an inter-positional polymer sleeve for transmitting bending stress in the assembly.

6. The assembly of Claim 1 wherein the contact occurs in one or more areas that frictionally carries the applied torque.

7. The assembly of Claim 6 wherein the contact area is calibrated so that the contact slips at a preset torque before the failure strength of the shaft is reached.

8. The assembly of Claim 1 wherein the female coupling member further comprises a counter-bore and the radially flexible member has an exterior surface adapted for engagement within the counter-bore.

9. The assembly of Claim 8 wherein the radially flexible member is compressed within the counter-bore.

10. The assembly of Claim 1 wherein the female coupling member is a fitting that connects the assembly to a cutting tool-bit or powered instrument.

11. The assembly of Claim 1 wherein the female coupling member further comprises a fitting with a cutting tool-bit.

12. The assembly of Claim 11 wherein the assembly is further connected to a powered instrument.

13. The assembly of Claim 1 wherein the radially flexible member is a split collet.

14. The assembly of Claim 1, the radially flexible member being in the form of a collar and made of super-elastic alloy, wherein the relative motion further induces a super-elastic activation of the collar.

15. The assembly of Claim 1 wherein the collar further comprises a washer.

16. The assembly of Claim 15 wherein the collar further comprises a series of washers.

17. The assembly of Claim 14 wherein the super-elastic alloy is a nickel-titanium alloy.

18. A torque-transmitting coupling assembly comprising:

a) a split collet member having an exterior surface and an opening;

b) an elongated shaft member made of a super-elastic alloy, received within the opening; and

c) a sleeve member having a bore that receives the exterior surface of the collet,

whereupon relative motion among at least two of the members causes the opening to contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collet into surface-to-surface contact, securing the members together in a fixed relative position.

19. The assembly of Claim 18 wherein interfering engagement of the exterior surface with the bore compresses the opening against the shaft, inducing the super-elastic activation in the shaft.

20. The assembly of Claim 18 wherein the shaft is tubular with a cannulation.

21. The assembly of Claim 20 wherein either the sleeve or collet has a cannulation aligned with the shaft cannulation, for common passage of a guide wire there through.

22. The assembly of Claim 18 further comprising an inter-positional polymer sleeve for transmitting bending stress in the assembly.

23. The assembly of Claim 18 wherein the surface-to-surface engagement occurs along one or more contact areas that frictionally carries the applied torque.

24. The assembly of Claim 23 wherein the contact area is calibrated to slip at a preset torque before the failure strength of the shaft is reached.

25. The assembly of Claim 18 wherein the collet is connected to a cutting tool-bit or powered instrument.

26. The assembly of Claim 18 wherein the collet further comprises a cutting tool-bit.

27. The assembly of Claim 26 further coupled to a powered instrument.

28. A torque-transmitting coupling assembly comprising:

a) a fitting member formed with a counter-bore;

b) a collar member made of super-elastic alloy, having an exterior surface and an opening, the collar being located in the counter-bore; and

c) an elongated shaft member made of a super-elastic alloy, received within the opening;

whereupon relative motion between the fitting and the collar causes the collar to contact the shaft, inducing a super-elastic activation in the shaft that engages the shaft and collar into surface-to-surface contact, securing the members together in a fixed relative position.

29. The assembly of Claim 28 wherein engagement of the exterior surface with the counter-bore super-elastically compresses the opening against the shaft.

30. The assembly of Claim 29 wherein the collar further comprises a washer.

31. The assembly of Claim 30 further comprising a series of washers.

32. The assembly of Claim 28 wherein the super-elastic alloy is a nickel-titanium alloy.

33. The assembly of Claim 28 wherein the shaft is tubular with a cannulation.

34. The assembly of Claim 33 wherein the fitting has a cannulation aligned with the shaft cannulation, for common passage of a guide wire there through.

35. The assembly of Claim 28 further comprising an inter-positional polymer sleeve for transmitting bending stress in the assembly.

36. The assembly of Claim 29 wherein the frictional engagement occurs along one or more contact areas that frictionally carries the applied torque.

37. The assembly of Claim 36 wherein the contact area is calibrated so that the coupling slips at a preset torque before the fatigue strength of the shaft is reached.

38. The assembly of Claim 28 wherein the fitting is connected to a cutting tool-bit or powered instrument.

39. The assembly of Claim 28 wherein the fitting further comprises a cutting tool-bit.

40. The assembly of Claim 39 further coupled to a powered instrument.

41. A method of forming a torque-transmitting assembly, comprising the steps of:

a) providing a female coupling member with a bore;

b) providing a radially flexible member with an external surface and an opening, situating the radially flexible member within the bore

c) providing an elongated shaft member made of a super-elastic alloy, received within the opening; and

d) relatively moving at least two of the members, causing the radially flexible member to contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and radially flexible member into surface-to-surface contact, securing the members together in a fixed relative position.

42. The method of Claim 41 wherein step d) further comprises frictionally engaging the members along a contact area that carries the applied torque, the contact area being calibrated to slip at a preset torque before the failure strength of the shaft is reached.

43. The method of Claim 42 further comprising the steps of providing the female coupling member with a counter-bore, providing the radially flexible member in the form of a collar made of super-elastic alloy and inducing a super-elastic activation in the collar.

44. The method of Claim 42 wherein step a) further comprises providing a radially flexible member in the form of a split collet.

45. A flexible surgical reamer having a torque-transmitting assembly and comprising:

a) a fitting member formed with a counter-bore and including a cutting tool-bit;

b) a collar member made of super-elastic alloy, located in the counter-bore; and

c) an elongated shaft member made of a super-elastic alloy, adapted for receipt within the collar;

whereupon relative motion among the members causes the opening to contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collar into surface-to-surface contact, securing the members together in a fixed relative position.

46. The reamer of Claim 45 wherein the collar is an annular member.

47. The reamer of Claim 46 wherein the collar further comprises a washer.

48. The reamer of Claim 47 wherein the collar further comprises a series of washers.

49. The reamer of Claim 48 wherein the collar is pre-assembled with the fitting.

50. The reamer of Claim 45 further comprising an inter-positional polymer sleeve for transmitting bending stress in the assembly.

51. The reamer of Claim 45 wherein the contact occurs along an area that frictionally carries the applied torque.

52. The reamer of Claim 51 wherein the contact area is calibrated to slip at a preset torque before the failure strength of the shaft is reached.

53. The reamer of Claim 45 wherein the shaft is tubular, with a cannulation.

54. The reamer of Claim 53 wherein the fitting has a cannulation that aligns with the shaft cannulation for passage of a guide wire through the reamer.

55. A flexible surgical reamer having a torque-transmitting assembly and comprising:

a) a radially flexible member having a split collet with an exterior surface and an opening, and including a cutting tool-bit;

b) an elongated shaft member made of a super-elastic alloy, received within the opening; and

c) a sleeve having a bore that receives the exterior surface,

whereupon relative motion among the members causes the opening to contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collet into surface-to-surface contact, securing the members together in a fixed relative position.

56. The reamer of Claim 55 wherein the exterior surface is compressed by the bore, further contracting the opening against the shaft to induce the super-elastic activation.

57. The reamer of Claim 55 wherein the shaft is tubular with a cannulation for passage of a guide wire there through.

58. The reamer of Claim 56 wherein the opening interferingly receives the shaft and is expanded to compress the exterior surface against the bore.

59. The reamer of Claim 55 further comprising an inter-positional polymer sleeve for transmitting bending stress in the assembly.

60. The reamer of Claim 55 wherein the contact occurs along an area that frictionally carries the applied torque.

61. The reamer of Claim 60 wherein the contact area is calibrated to slip at a preset torque before the failure strength of the shaft is reached.

62. The reamer of Claim 61 wherein the shaft is further connected to a powered instrument.

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ABSTRACT